General introduction to simulation models

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General introduction to simulation models

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Monte Carlo simulation can be defined as a representation of real life systems to gain insight into their functions and to investigate the effects of alternative conditions or actions on the modeled system. Models are a simplification of a system. Most often, it is best to use experiments and field trials to investigate the effect of alternative conditions or actions on a specific system. Nonetheless, field trials are expensive and sometimes not possible to conduct, as in case of foot-and-mouth disease (FMD). Instead, simulation models can be a good and cheap substitute for experiments and field trials. However, if simulation models would be used, good quality input data must be available.

To model FMD, several disease spread models are available. For this project, we chose three simulation model; Davis Animal Disease Spread (DADS), that has been upgraded to DTU-DADS, InterSpread Plus (ISP) and the North American Animal Disease Spread Model (NAADSM). The models are rather data intensive, but in varying degrees. They generally demand data on the farm level, including farm location, type, number of animals, and movement and contact frequency to other farms.

To be able to generate a useful model of FMD spread that can provide useful and trustworthy advises, there are four important issues, which the model should represent: 1) The herd structure of the country in question, 2) the dynamics of animal movements and contacts between herds, 3) the biology of the disease, and 4) the regulations attached to the occurrence of the disease. Model inputs are usually given in distributions to represent biological variability as well as uncertainty. Subsequently, model outputs are usually given as distributions, sometimes with wide ranges.

Use of modeling will help us to gain insight to a system as well as support decision making. However, several other factors affect decision making such as, ethics, politics and economics. Furthermore, the insight gained when models are build leads to point out areas where knowledge is lacking.